An Assessment of Carbon Sequestration Options in the Mt. Simon of the Illinois Basin

Session Title
Evaluation of Geological Formations

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Search for the Sequestration Target

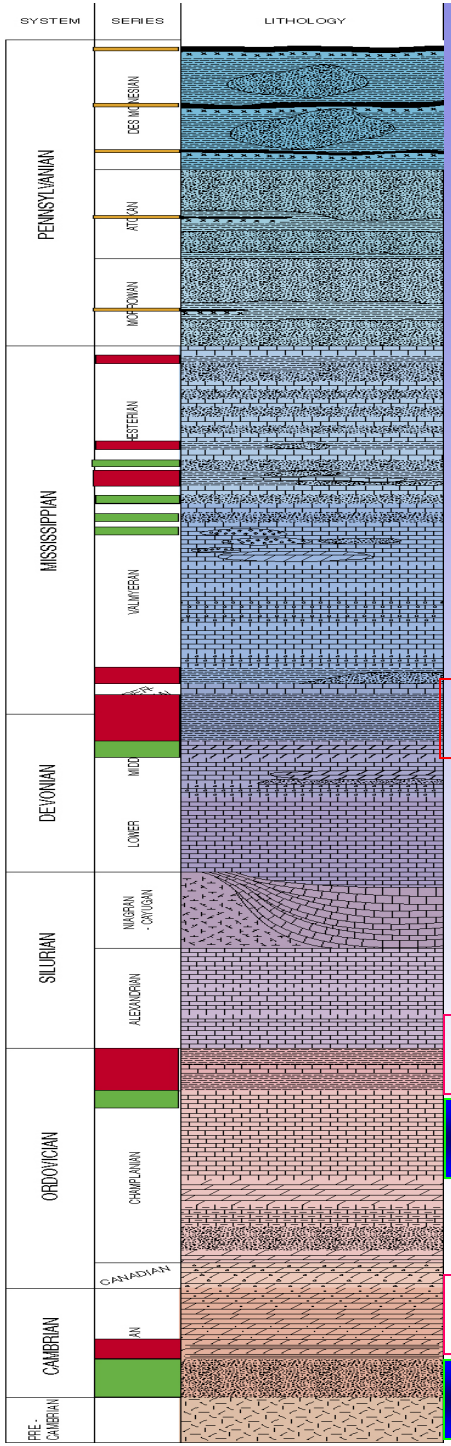
- Find a porous and permeable reservoir
- Find a safe place to sequester CO_2
- Know where your sequestered CO_2 is located

Why is the Mt. Simon a Good Sequestration Target

- In the Illinois Basin, the Mt. Simon reservoir may be able to sequester between 27 to 108 Btonnes of CO_2
- The Mt. Simon is widespread across most of the Midwest of the United States and it underlay's many of the coal fired powerplants in the area

What is the Mt. Simon?

Illinois Basin Stratigraphic Column Showing Seals and Sinks



New Albany (Seal)

Maquoketa (Seal)

St. Peter Sandstone (Sink)

Eau Claire (Seal)

Mt. Simon (Sink)

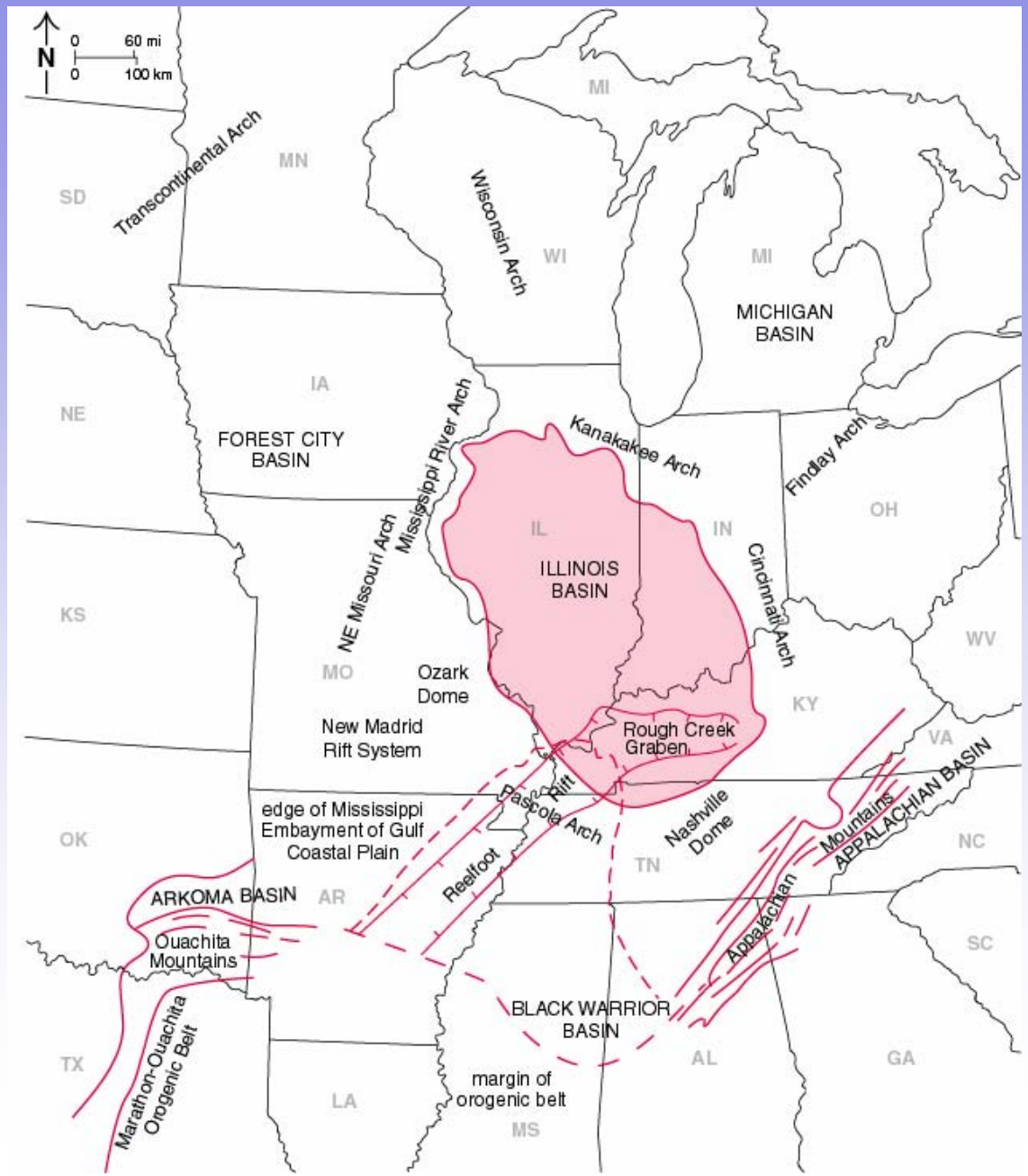
Mt. Simon is overlain by 3 thick impermeable shales and numerous thinner shale-rich strata

Potential Seal

Potential Sink

Coal Bed Potential Sink and Seal

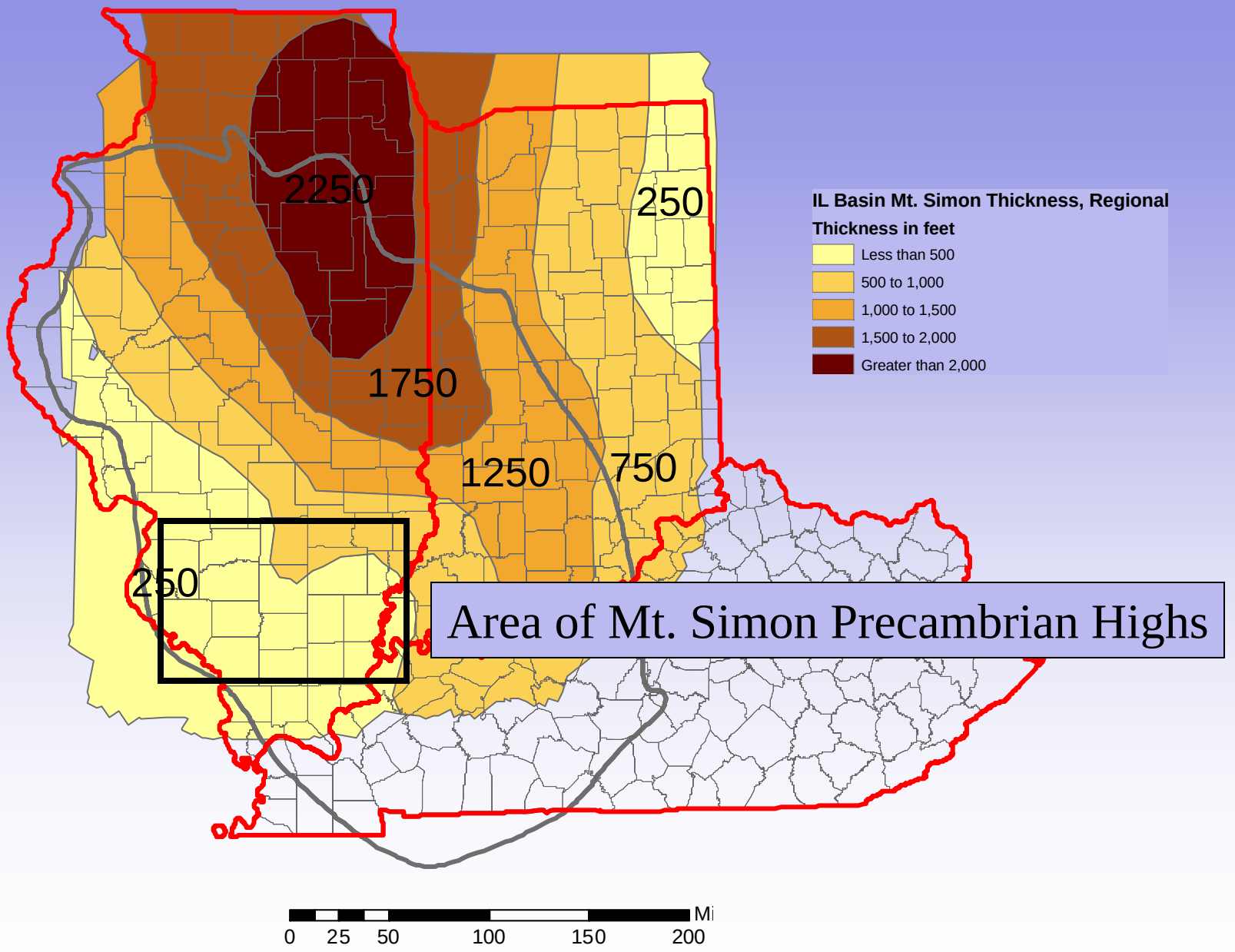
Illinois Basin



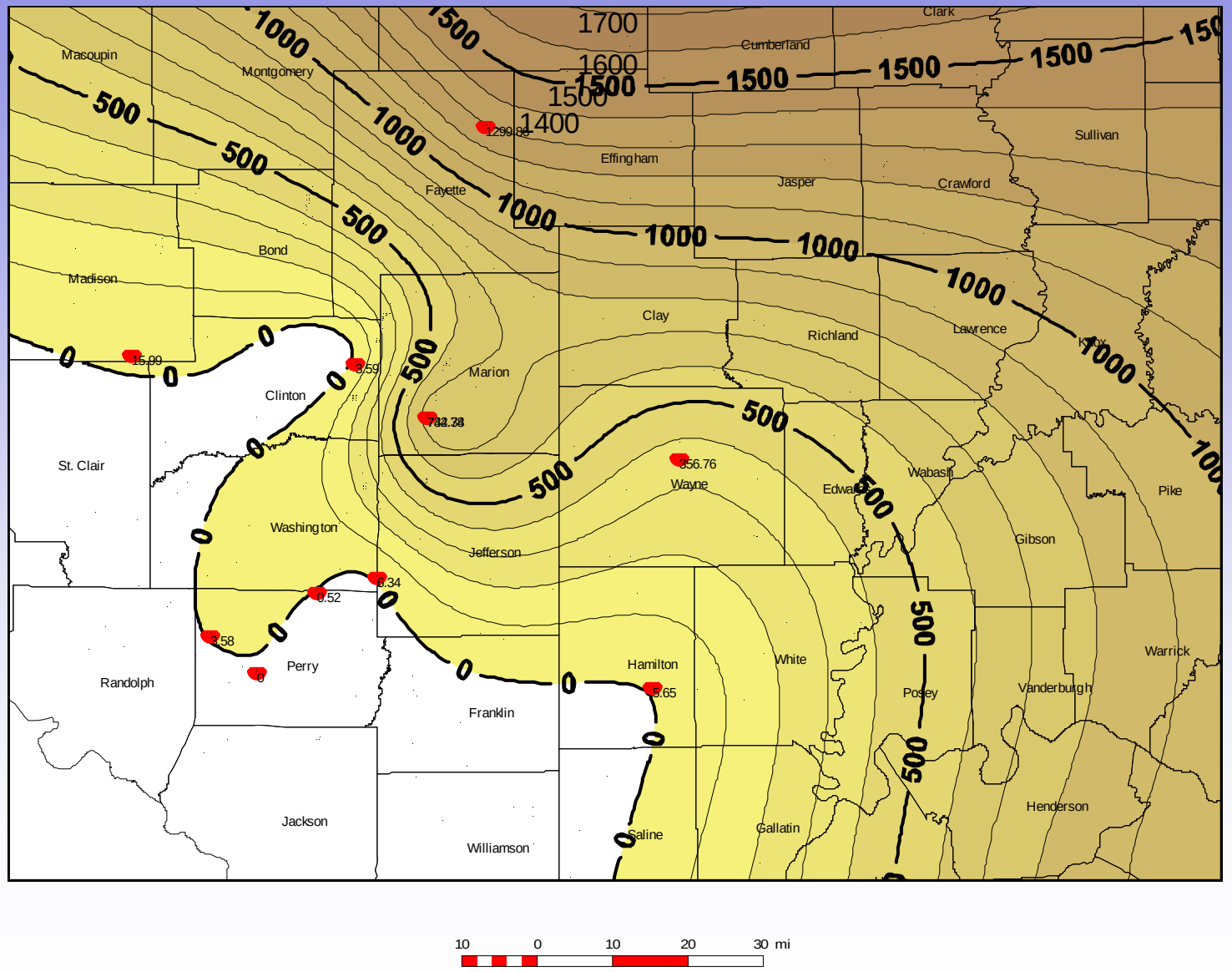
Mt. Simon
(Goal: find a target sequestration zone)

- Uncertainty in the reservoir?
  - How thick is the Mt. Simon?
  - What is the quality of the reservoir?
  - How is the reservoir distributed
    - Both vertically and horizontally
- Uncertainty of the seal?

Mt. Simon Thickness



Area of Mt. Simon Precambrian Highs

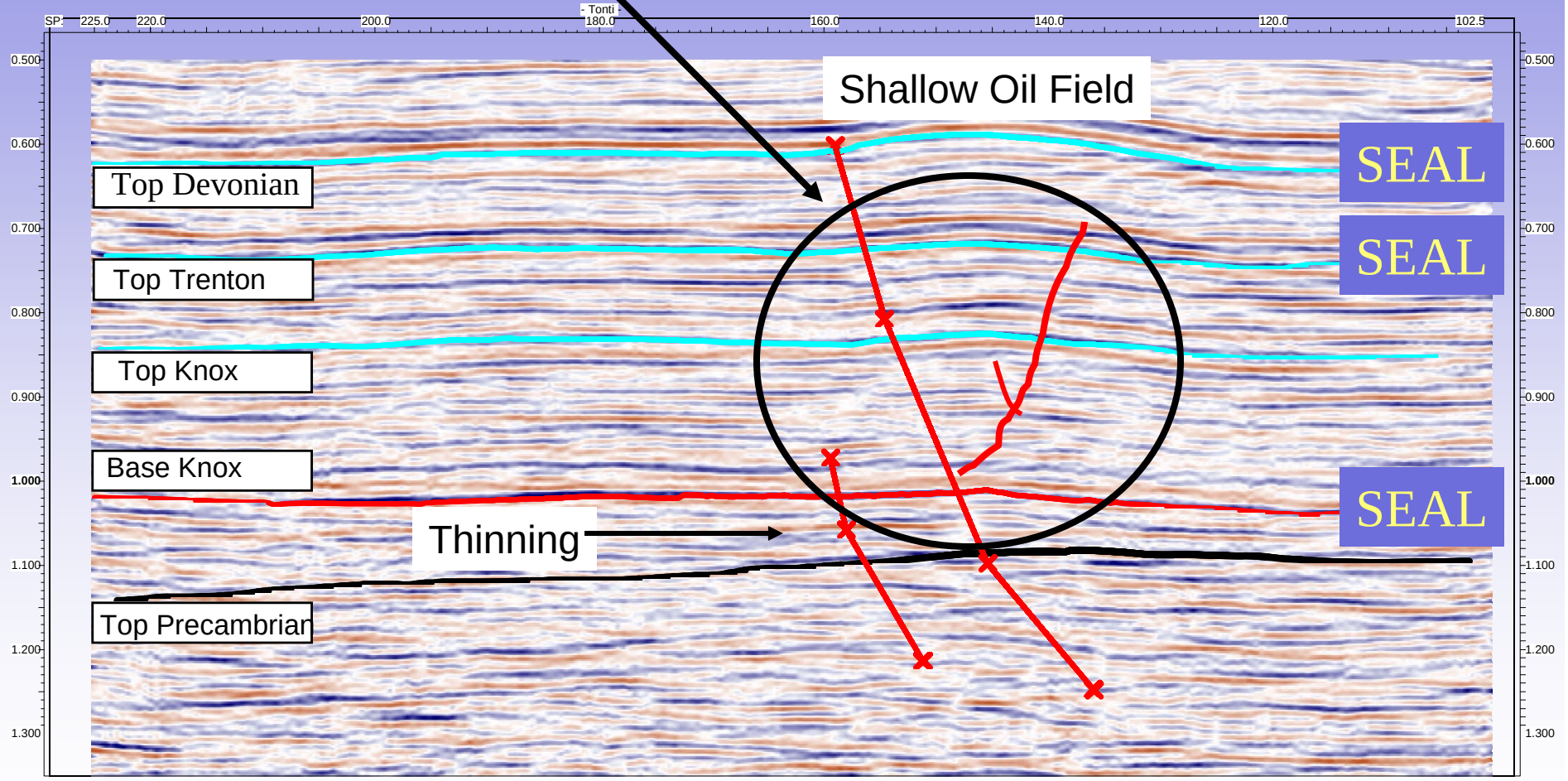


Uncertainty of the Seal
(Goal: Find a safe place)

- Some faults may not be sealing and could provide a conduit for fluid flow to shallower horizons

Tonti Area Faulting

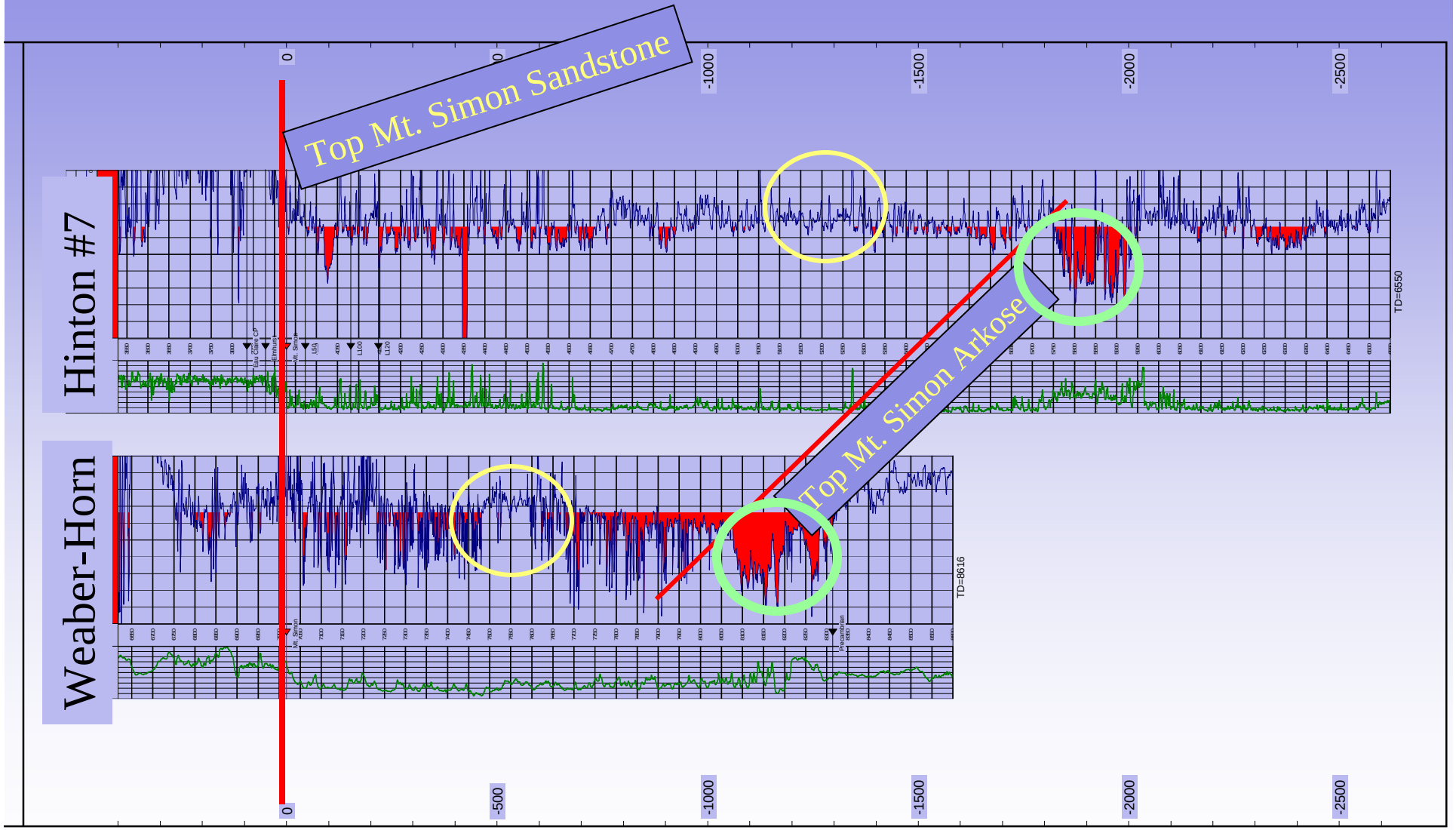
Are the faults Sealing?

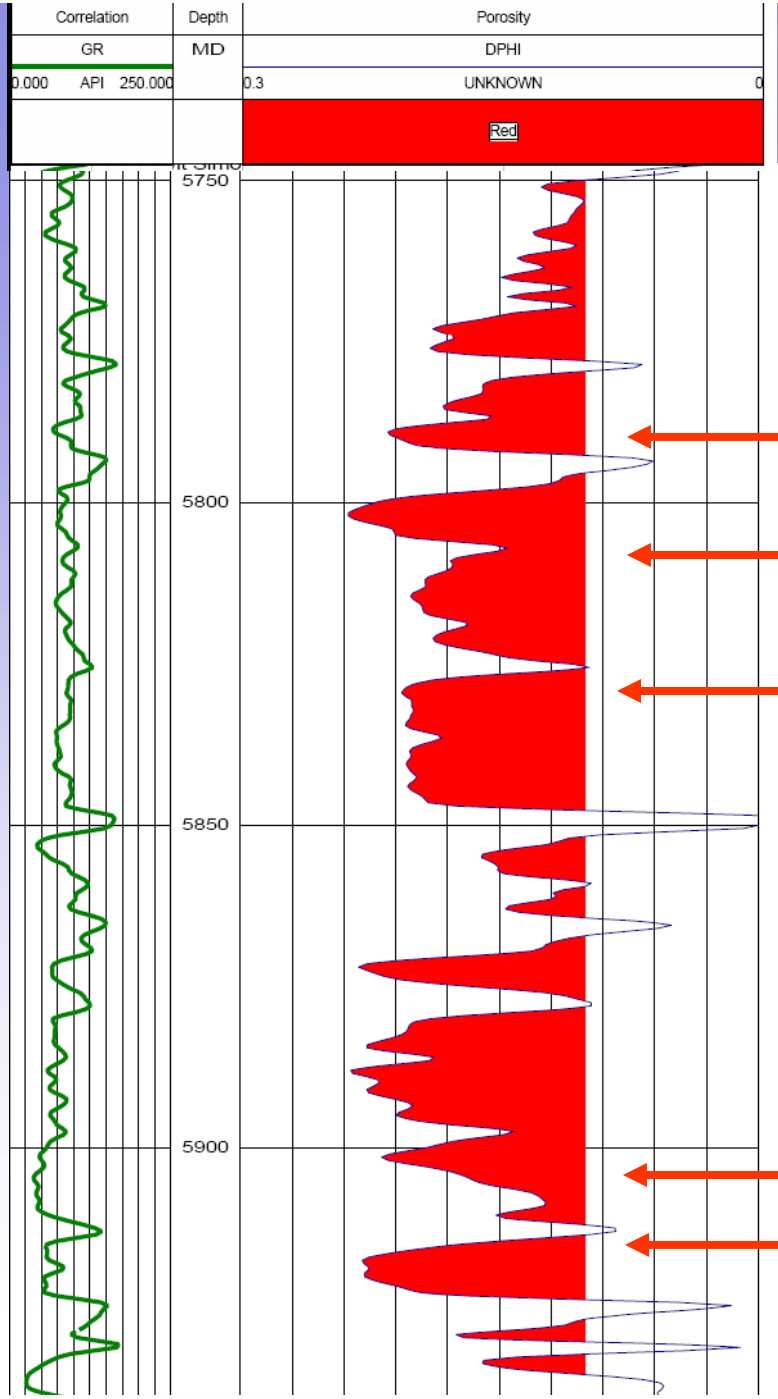


Uncertainty of the Reservoir Quality

- Hinton #7 in Champaign County has deep Mt. Simon core analysis
- Humble Oil Weaber-Horn #1 well is located on the Loudon Field anticline in Fayette County

Comparison of Hinton #7 and Weaber-Horn





Core Analysis Hinton #7

5789 ft, 54 mD, 21.1 Ø

5815 ft, 617 mD, 20.8 Ø

5836 ft, 1300 mD 23.1 Ø

Rocks can contain up to 20% Potassium Feldspar. Leached grains throughout sample

5904 503 mD, 19.1 Ø

5916 ft, 9.08 mD, 20.3 Ø

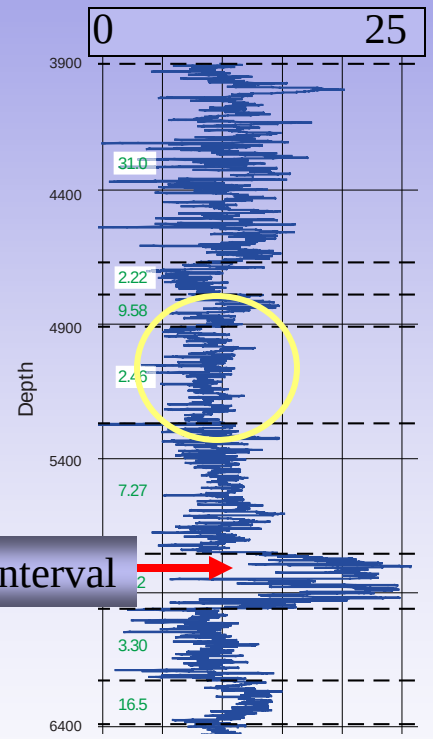
Hinton #7

Porosity

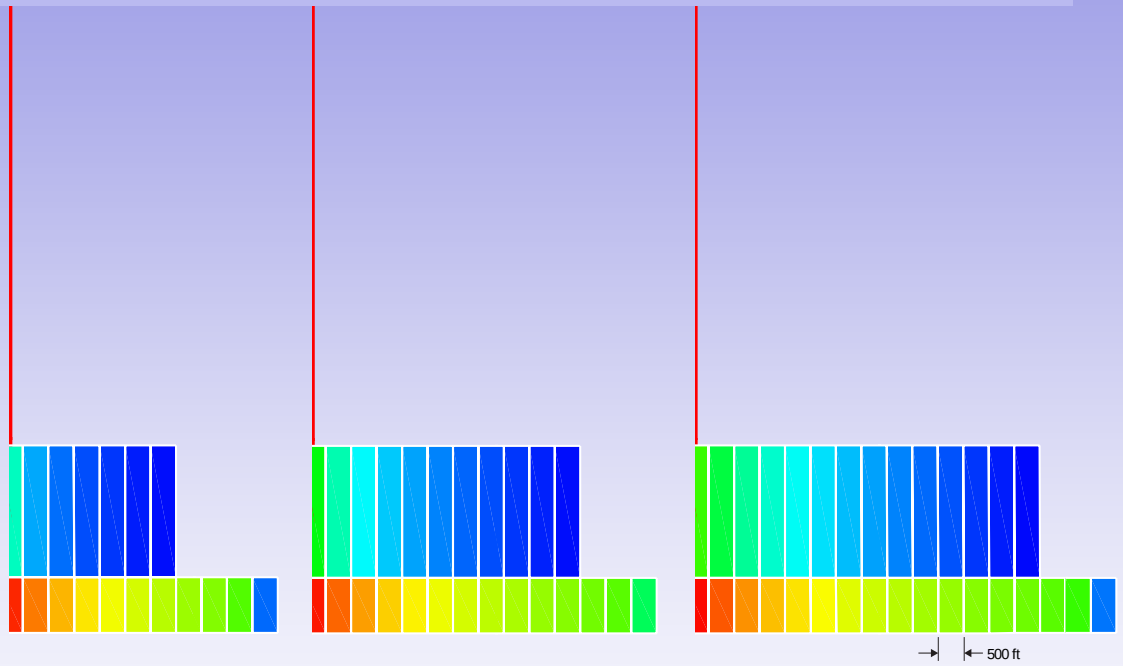
2.5 million tonnes/yr for 10 years

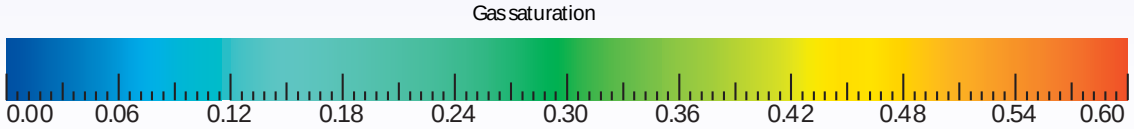
2.5 million tonnes/yr for 20 years

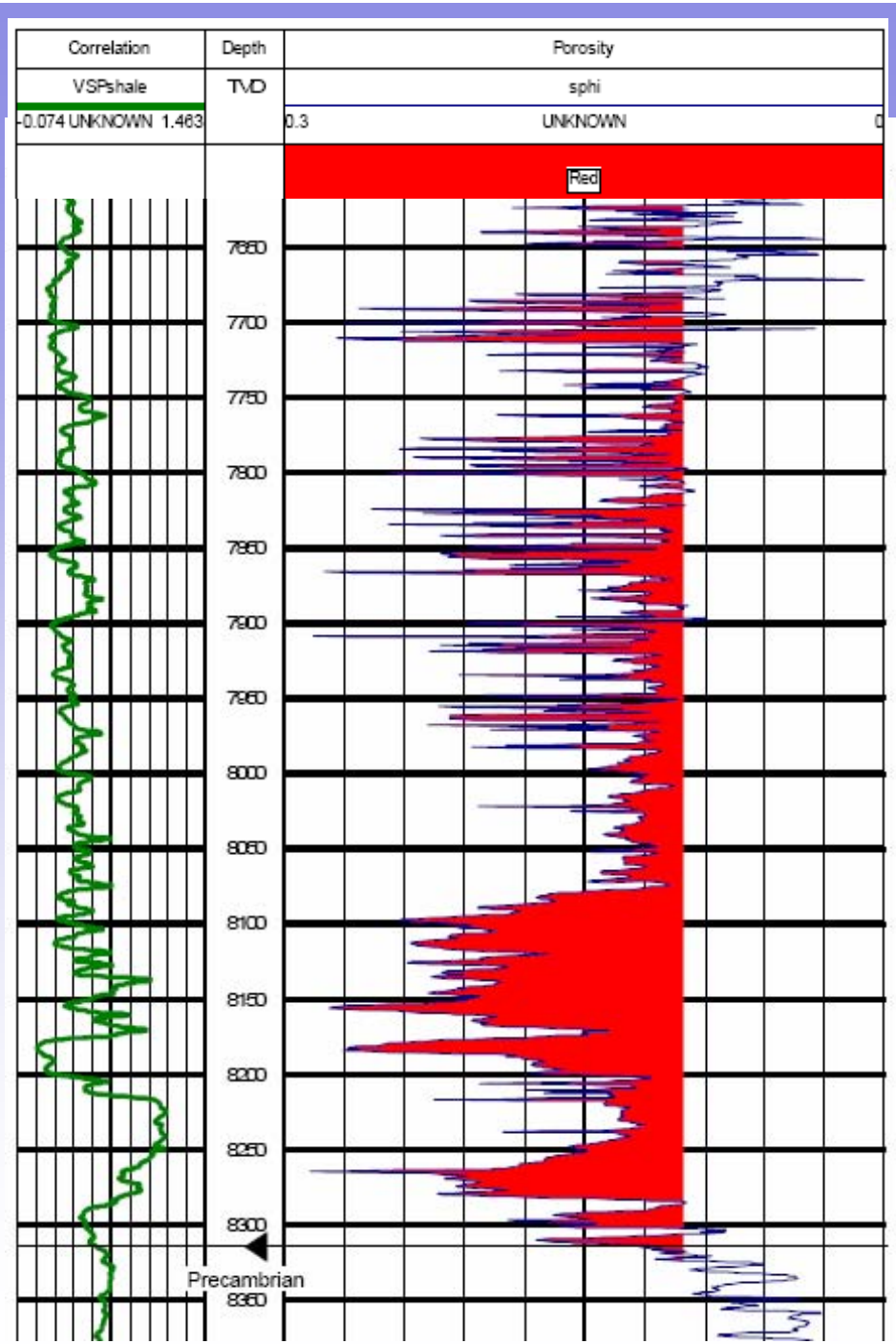
2.5 million tonnes/yr for 30 years



Injection Interval







Weaber-Horn Porosity Log Derived from Sonic

Arkosic, poorly sorted, medium to coarse grained, abundant feldspar

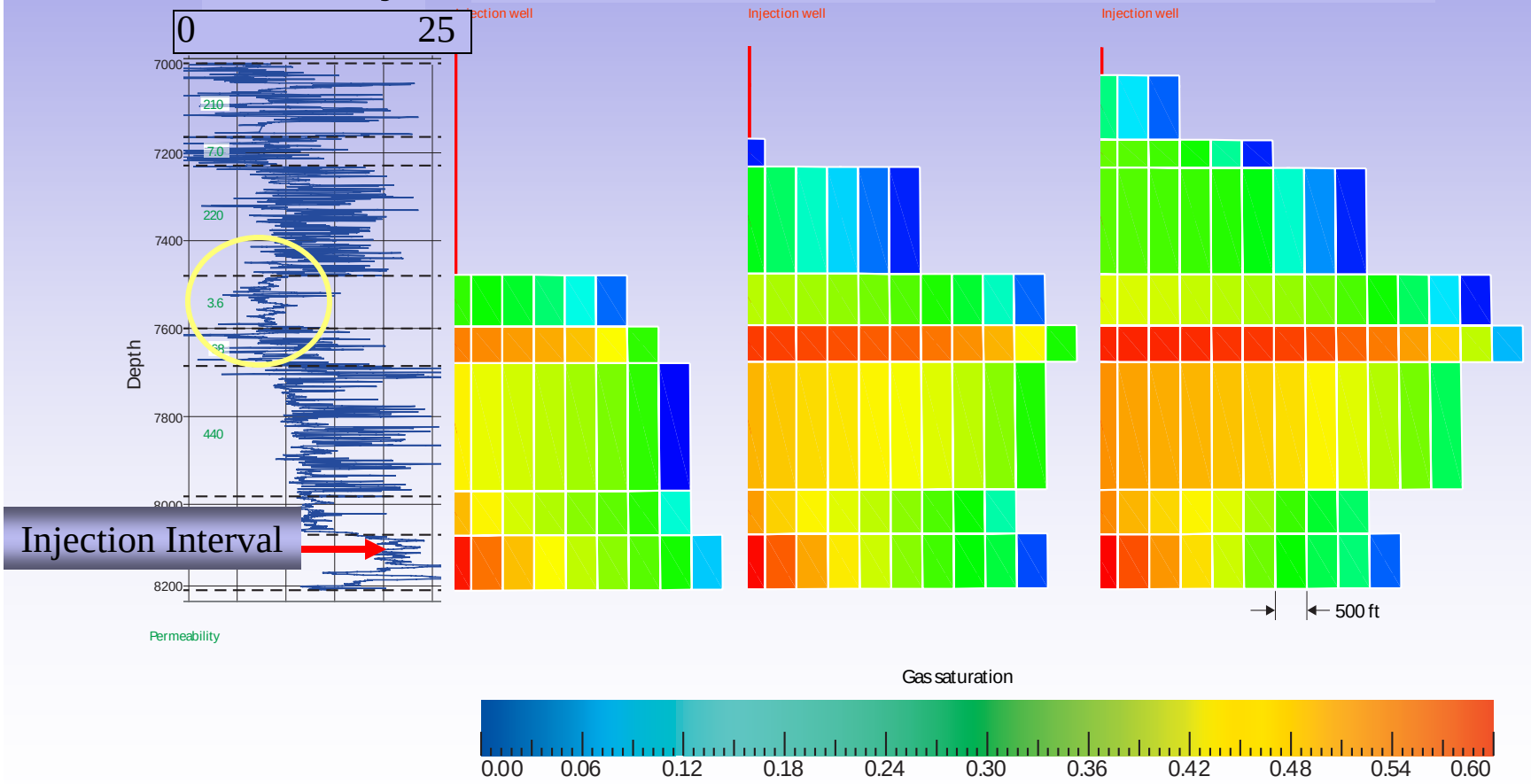
Weathered Granite (Saprolite)

Weaber-Horn #1

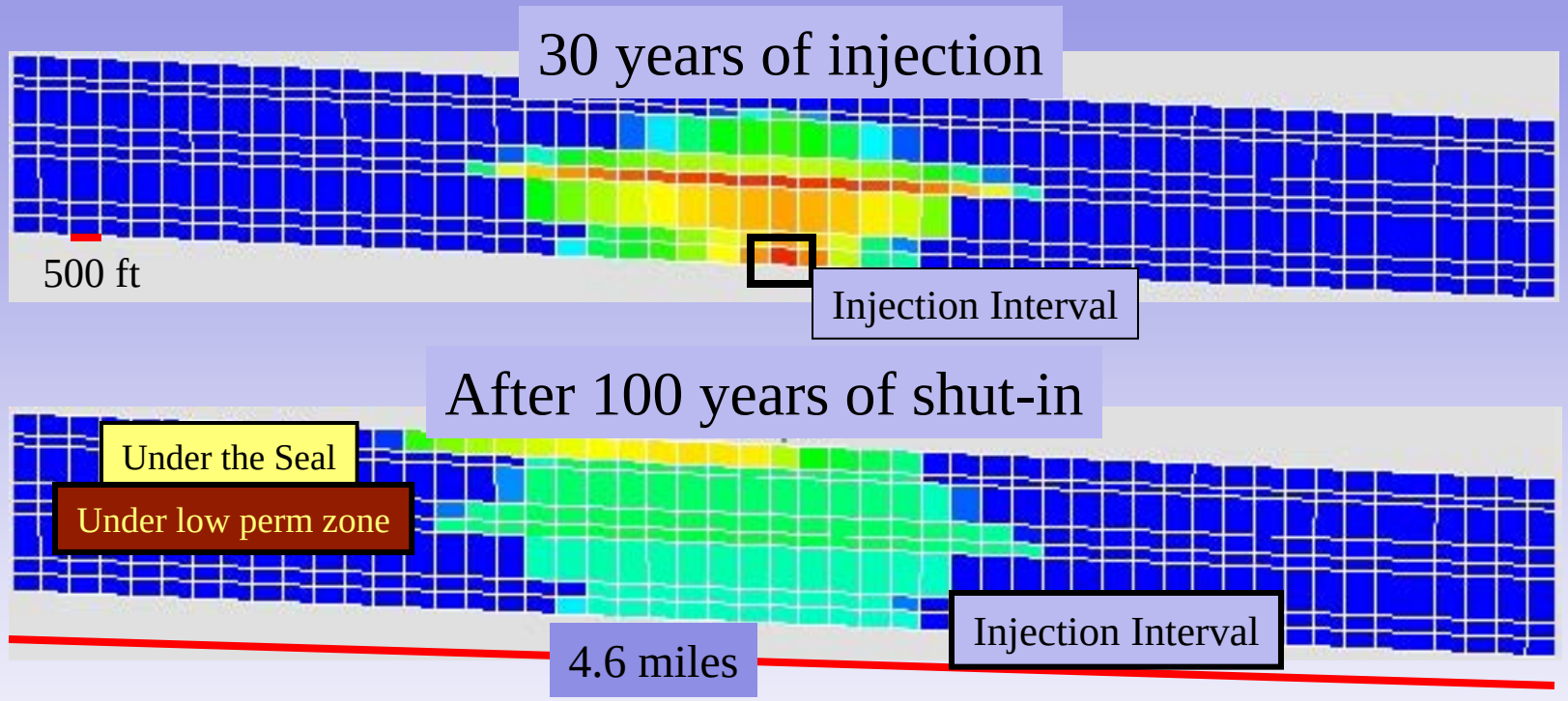
2.5 million tonnes/yr for 10 years

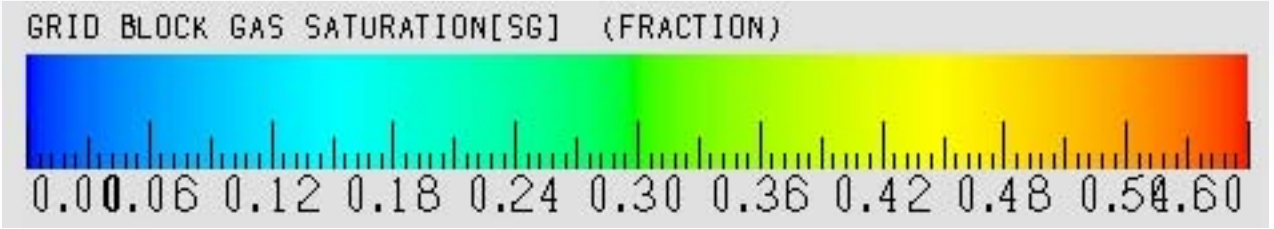
2.5 million tonnes/yr for 20 years

2.5 million tonnes/yr for 30 years

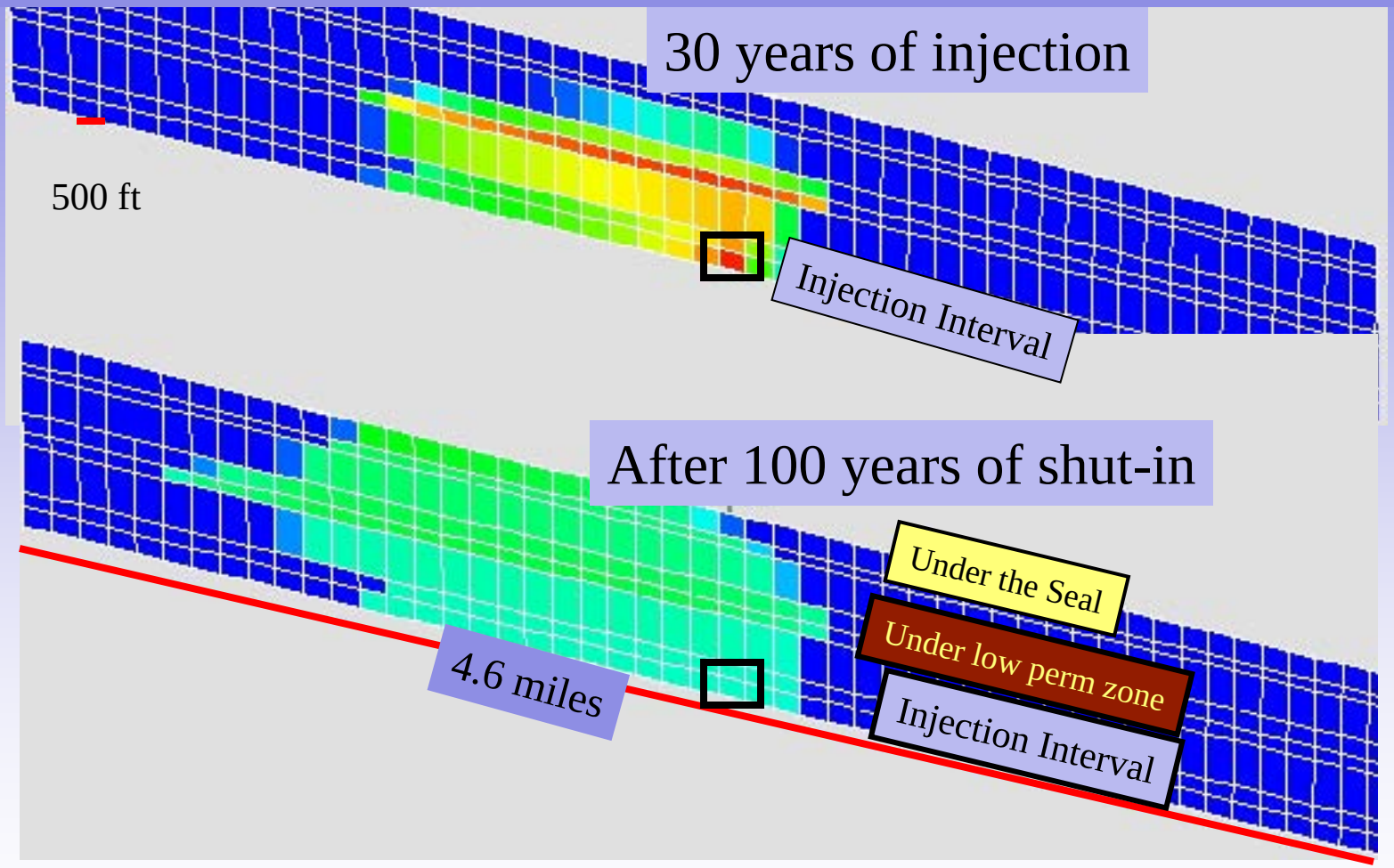


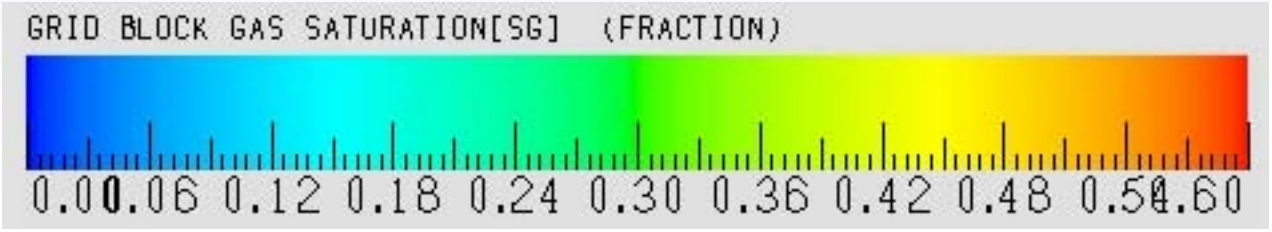
Injection into the Weaber-Horn
1 degree dipping beds

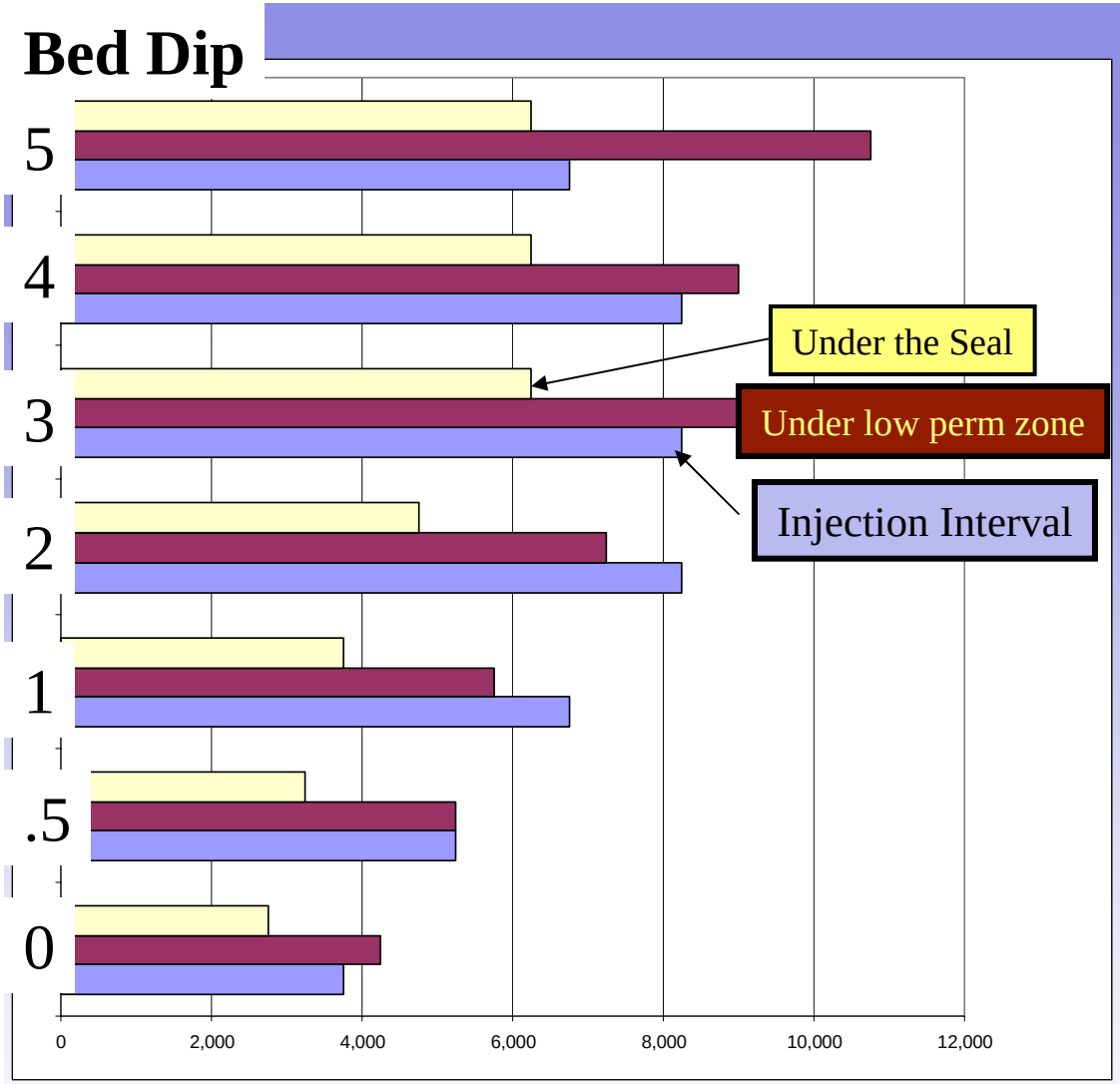




Injection into the Weaber-Horn 5 degree dipping beds



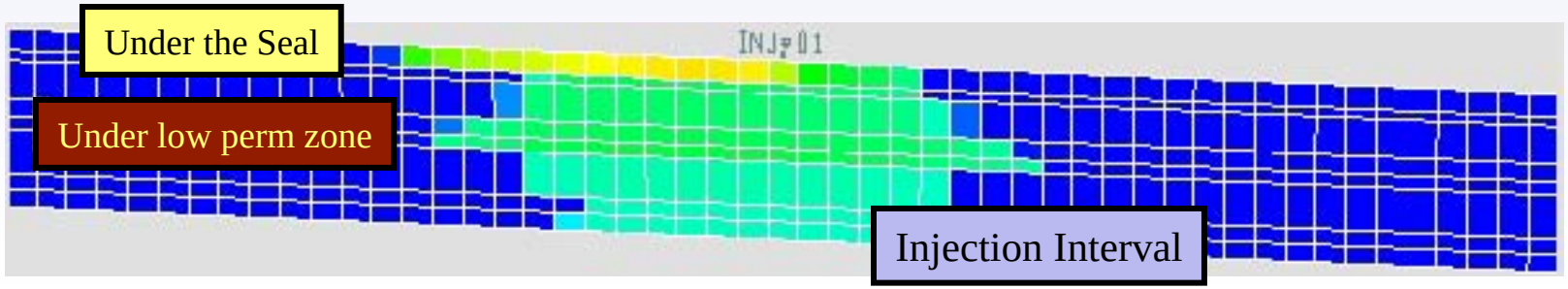




How far does CO_2 Migrate **Injection of 1million tonnes/year**

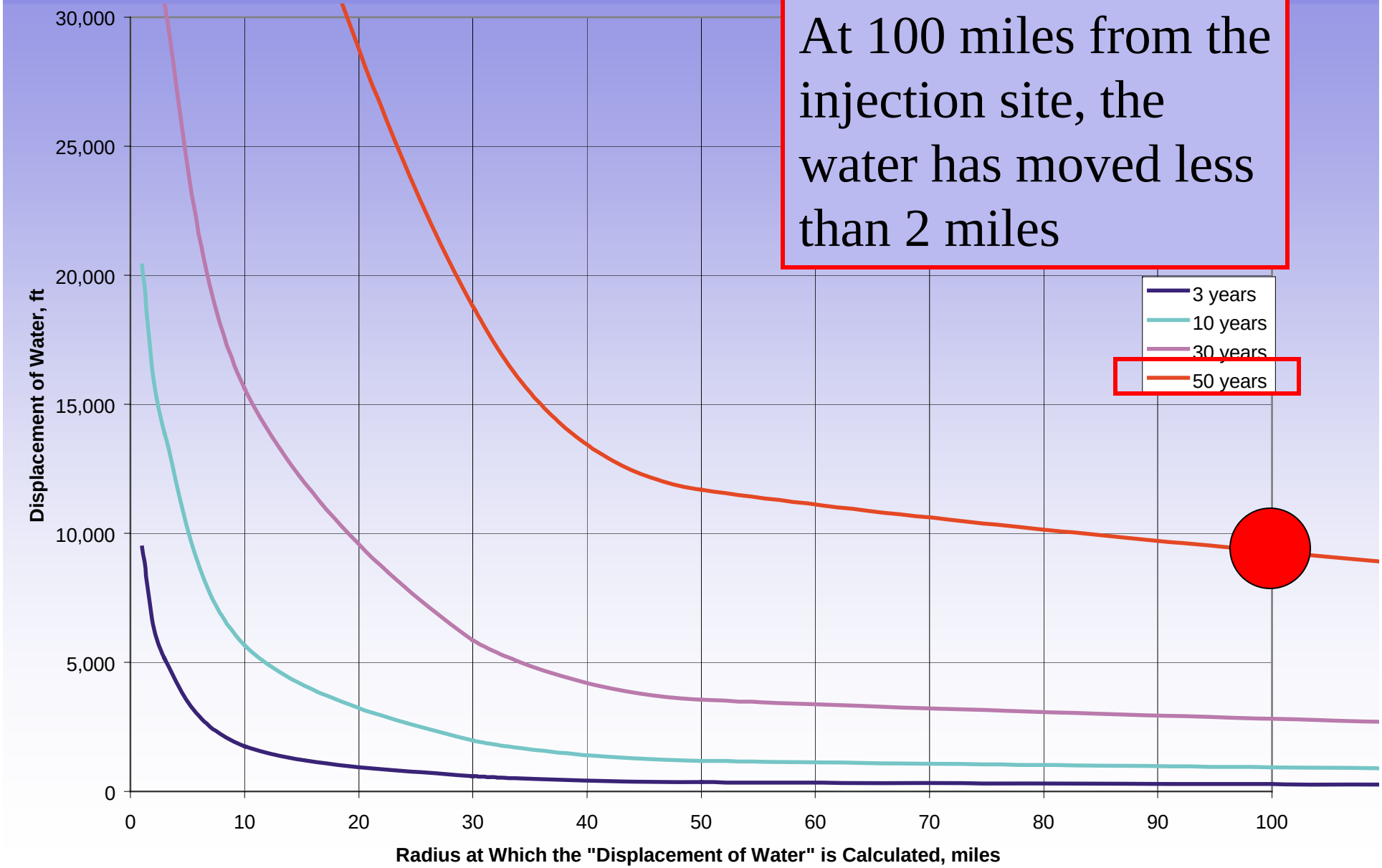
At 0 degree dip CO_2 migrated 4200 feet

At 5 degree dip CO_2 migrated 10750 feet



What Happens to the Water that is Displaced?

30 Million Tonnes per year
(Equivalent to 6-10 large Power Plants)



What do you have to be concerned about?

- Reservoir heterogeneities going to change your sequestration project.
- The dip of the beds makes a difference.
- Faults need to be evaluated.
- Water displacement is only an issue if there are lots of high volume injection sites.

End of Presentation